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INTERNATIONAL PRELIMINARY EXAMINATION REPORT
(PCT Article 36 and Rule 70)

Applicant's or agent's file reference GW-SAR-9298-PCT		FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/PEA/416)
International application No.. PCT/GB 03/01220	International filing date (day/month/year) 24.03.2003	Priority date (day/month/year) 23.03.2002
International Patent Classification (IPC) or both national classification and IPC B05D3/04		
Applicant UNIVERSITY OF DURHAM et al.		
<p>1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 5 sheets, including this cover sheet.</p> <p><input checked="" type="checkbox"/> This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).</p> <p>These annexes consist of a total of 4 sheets.</p>		
<p>3. This report contains indications relating to the following items:</p> <p>I <input checked="" type="checkbox"/> Basis of the opinion</p> <p>II <input type="checkbox"/> Priority</p> <p>III <input type="checkbox"/> Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</p> <p>IV <input type="checkbox"/> Lack of unity of invention</p> <p>V <input checked="" type="checkbox"/> Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</p> <p>VI <input type="checkbox"/> Certain documents cited</p> <p>VII <input type="checkbox"/> Certain defects in the international application</p> <p>VIII <input type="checkbox"/> Certain observations on the international application</p>		
Date of submission of the demand 22.09.2003		Date of completion of this report 21.06.2004
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465		Authorized Officer Bochelen, D Telephone No. +49 89 2399-8150 

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. **PCT/GB 03/01220**

I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

Description, Pages

1-26 as originally filed

Claims, Numbers

1-22 filed with telefax on 27.04.2004

Drawings, Sheets

1/23-23/23 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:
- ☐ the drawings, sheets:

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5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	1-22
	No: Claims	
Inventive step (IS)	Yes: Claims	1-22
	No: Claims	
Industrial applicability (IA)	Yes: Claims	1-22
	No: Claims	

2. Citations and explanations

see separate sheet

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/GB 03/01220

Re Item V

Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

Reference is made to the following documents:

- D2: EP-A-0 574 352 (CIBA GEIGY AG) 15 December 1993 (1993-12-15)
- D3: US-A-5 318 552 (SHIBA DAISUKE ET AL) 7 June 1994 (1994-06-07)
- D4: US-A-5 972 505 (BAGRODIA SHRIRAM ET AL) 26 October 1999 (1999-10-26)
- D5: WO 92 00407 A (EASTMAN KODAK CO) 9 January 1992 (1992-01-09)
- D6: US-A-5 236 563 (LOH INH-HOUNG) 17 August 1993 (1993-08-17)

If not indicated otherwise the relevant passages are those mentioned in the search report.

1. Novelty and inventive step:

1.1 Prior art:

Document D2 discloses a process for the surface modification, i.e imparting hydrophilicity, of a polymer substrate by plasma treatment, e.g. with Argon.

Document D3 discloses a method for imparting absorptivity to a material by bonding a hydrophilic polymer to a fibre by plasma treatment.

Document D4 discloses a process for improving the liquid transport properties of a fibre by plasma treatment.

Document D5 discloses a process for improving the liquid transport properties of a fibre by plasma treatment.

Document D6 discloses a process for modifying the surface properties of a polymeric substrate by cross-linking the polymer with a plasma treatment.

- 1.2 Document D2 which is considered to be the closest prior art discloses a process for imparting hydrophilicity to a polymer substrate by plasma treatment.**

The subject-matter of claim 1 differs in that the process comprises first a cross-linking step followed by plasma deposition or plasma modification. The problem to be solved may thus be regarded as to provide an improved process for conditioning substrates. The two step plasma treatment imparts improved properties of stability and wettability to the material (see p22-23, fig.13-15) which was not predictable in view of the prior art. Therefore, claim 1 is considered as inventive insofar as the cross-linking is performed by plasma treatment.

- 1.3 The subject-matter of claim 22 is a substrate modified by the process of claim 1. The two step plasma treatment results in an improvement of the properties of the substrate (see point 1.2). Claim 22 is thus new and inventive.

REPLACED BY
ART 34 AMDTClaims

1. A method of applying a conditioning effect to a material substrate, said method including the step of performing a plasma modification and/or plasma deposition treatment on the substrate, said conditioning effect comprising exposing the substrate to any, or any combination of, at least two treatment steps: (i) cross-linking of either or both the exterior and internal surfaces of the substrate; and/or (ii) plasma modification or plasma deposition of/onto the cross-linked material.
2. A method according to claim 1 wherein steps (i) and (ii) are both performed and in sequence.
3. A method according to claim 1 wherein the precursor gas used in the generation of the plasma is a noble, inert or nitrogenous gas.
4. A method according to any preceding claims wherein the coating material is modified in the form of a hydrophilic layer in the first step with the plasma treatment in the second step acting to oxidise or nitrogenate the material.
5. A method according to claim 4 wherein the precursor gas or liquid used in the plasma treatment step are oxygen or nitrogen containing chemical compounds.
6. A method according to any of the preceding claims wherein an oxidation method is used in the form of ozonolysis.
7. A method according to claim 1 wherein the precursor gas or liquid used for the plasma treatment in step 2 (ii) contains fluoride.

REPLACED BY
ART 34 AMDT

8. A method according to claim 1 wherein the plasma used is a non-equilibrium plasma generated by a radio frequency, microwaves and/or direct current.
9. A method according to any of the preceding claims wherein the plasma power applied during the first step is in the range of 0.01 watt to 500 watts.
10. A method according to any of the preceding claims wherein the plasma power applied during the second step is in the range of 0.01 watt to 500 watts.
11. A method according to any of the preceding claims wherein the plasma power applied during either or both of the first and second steps is pulsed.
12. A method according to any of the preceding claims wherein the precursor gas or liquid introduced during either or both the first and second steps is pulsed.
13. A method according to any of the preceding claims wherein the substrate is defined as any article capable of supporting a coating applied thereto.
14. A method according to claim 13 wherein the substrate is a porous article with an exterior surface, a bulk matrix and pores extending from the exterior surface into the bulk matrix, said bulk matrix exterior and interstitial surfaces, at least in part, polymeric or oligomeric.
15. A method according to claim 14 wherein the bulk matrix is a polyolefin.

16. A method according to Claim 15 wherein the bulk matrix has a void volume ranging from 0.01% to 99%.

17. A method according to any of the preceding claims wherein step (i) is controlled such that the effect of said step is controlled to be applied to a limited depth of the material below the external surface.

18. A method according to any of the preceding claims wherein in step (ii) the effect of said step is controlled to be applied to a limited depth into the material below the external surface of the substrate.

19. A method according to any of the preceding claims wherein the plasma used in either or both steps (i) and (ii) is selectively applied to localised areas across the substrate surface and/or below the substrate surface.

20. A method according to any of the preceding claims wherein the material is an absorbent, hydrophobic polymer which is heated by step (i) to be cross linked by a noble gas plasma to improve its ability to retain liquid and render it super-absorbent.

21. A method according to claim 20 wherein the material is modified by a subsequent nitrogenating plasma as step (ii) to render said cross linked polymer compatible with amine functionalities to form a super-absorbent polymer capable of retaining large quantities of amine containing aqueous solutions.

22 A method according to any of the preceding claims wherein the substrate is a superabsorbent material.

23 A substrate having a modified surface, said surface modified by the method as set out in any of claims 1-22.

REPLACED BY
ART 34 AMDT

chemical and
physical

and properties
of the

INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 03/01220

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 B05D3/04 B05D3/14 C08J7/18 A61L15/60

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 C08J A61L B05D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ, EMBASE, BIOSIS, COMPENDEX, CHEM ABS Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P, X	WO 02 26871 A (BASF AG ; BECK MARTIN (DE); MOHR BERNHARD (DE); BAUMGARTL HORST (DE) 4 April 2002 (2002-04-04) page 2, line 42 - page 3, line 26 ---	1-6, 13, 14, 20, 23
X	EP 0 574 352 A (CIBA GEIGY AG) 15 December 1993 (1993-12-15) page 2, line 50 - line 57 examples 4, 6, 9 ---	1-23
X	US 5 318 552 A (SHIBA DAISUKE ET AL) 7 June 1994 (1994-06-07) column 6, line 45 - line 60; claim 8 ---	1-23
X	US 5 972 505 A (BAGRODIA SHRIRAM ET AL) 26 October 1999 (1999-10-26) column 27; example 7 column 52; example 27 ---	1-23
-/--		

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents :

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

- *T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
- * & * document member of the same patent family

Date of the actual completion of the international search

7 August 2003

Date of mailing of the international search report

14/08/2003

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INTERNATIONAL SEARCH REPORT

International Application No
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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 92 00407 A (EASTMAN KODAK CO) 9 January 1992 (1992-01-09) page 30; example 7	1-23
X	US 5 236 563 A (LOH INH-HOUNG) 17 August 1993 (1993-08-17) column 3, line 13 - line 40	1-19, 23

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/GB 03/01220

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